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**THE MIGRATION OF FLOUNDER IN THE NORTHERN
BALTIC SEA**

by

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Abstract

A total of 5938 flounder were tagged in 1975-77 in Finland. By the end of 1982, 650 individuals were recovered. According to the taggings, the flounder population in Sub-divisions 29N and 30 is very local. Only 1 % of the recaptures were made outside the Sub-divisions. In the case of the fish tagged in the Gulf of Finland (Sub-division 32), 21 % of the recoveries were made in Sub-divisions 29N and 29S; of the flounder recaptured in the Gulf of Finland 71 % were found near the Finnish coast and 29 % had migrated to the USSR coast. The mean total instantaneous mortality rate for 1975-77 estimated from the tagging data was $Z = 0.75$.

Résumé

Un total de 5938 filets a été marqué en Finlande pendant la période 1975-77. Jusqu'à la fin 1982, 650 spécimens ont été retrouvés. D'après les marquages, la populations de flet des sous-divisions 29N et 30 est très locale. Seulement 1 % des recaptures a été retrouvés hors de ces sous-divisions. Dans le golfe de Finlande (sous-division 32), 21 % des recaptures le furent dans les sous-divisions 29N et 29S. Du flet recapturé dans le golfe de Finlande, 71 % le fut près de la côte finlandaise et 29 % avait migré vers la côte de l'URSS. Le taux de mortalité instantanée moyen estimé d'après les données de marquage pour la période 1975-77 fut de $Z = 0.75$.

Introduction

Flounder are distributed in all parts of the Baltic, except the northern part of the Bothnian Bay and the easternmost part of the Gulf of Finland. Taggings have shown that they form several fairly distinct populations in the southern Baltic (CIEGLEWICZ 1963, BAGGE 1966, OTTERLIND 1967). These populations are bound to the coastal areas and perform migrations mainly from shallow to deeper waters and along the coast. Migration between these populations has also been noted. In the northern Baltic, flounder also form distinct local populations, which have some exchange with the population in the central Baltic (HALME 1962, OTTERLIND 1966, VITINSH 1976, ARO & SJÖBLOM 1982).

In stock assessment the unit should be clearly defined and when mixture of stocks takes place coherence needs to be demonstrated and should not merely be assumed. In this report the migration of flounder in the northern Baltic is described and the discreteness of the stocks discussed.

Material and methods

A total of 5938 flounder were tagged during 1975-77 with yellow Petersen discs in the Åland Islands (60°01'N; 20°00'E, 5611 specimens in 1975-77) and in the western part of the Gulf of Finland (59°53'N; 23°45'E, 327 specimens in 1975) (Table 1). Over 97 % of the tagged flounder exceeded 20 cm in length (Table 2). About 63 % were tagged in April-June and the rest in October-December. The flounder were caught with gillnets. In both tagging places the flounder were held some days in a fish chest before tagging and liberation. Only flounder that were in good condition were tagged. The tagged flounder were liberated near the fishing places. The survival and the total instantaneous mortality rates were estimated by the method presented by PAULIK (1962).

Results

According to the taggings made in the Åland Islands, the population in Sub-divisions 29N and 30 is very local and bound to the coast. Of the recaptures made within five years after tagging, 98 % came from near the tagging place or the adjacent archipelago. Only 1 % of the tagged flounder emigrated from Sub-divisions 29N and 30 (Figs. 1-3). In the Gulf of Finland the taggings gave

different results. About 21 % of the tagged fish emigrated from the Gulf of Finland to Sub-divisions 29N and 29S; 14 % were found in Sub-division 29S and 7 % in Sub-division 29N. Of the flounder recaptured in the Gulf of Finland, 71 % were found near the Finnish coast and 29 % had migrated to the USSR coast (Fig. 4).

Seasonal migration between the coastal waters and deeper sea areas could not be shown by these taggings, because most of the recaptures were made during spring and summer in the gillnet fishery in the coastal zones. Very few recoveries were made in deeper sea areas in trawls. The total instantaneous mortality rate estimated from the tagging data varied from 0.75 to 0.95 in 1975-77. The mean total instantaneous mortality rate for the years 1975-77 was $Z = 0.75$ (Table 3).

Discussion

The recaptures in Sub-divisions 29N and 30 indicate that the population around the Åland Islands is very local, and the recoveries made outside these Sub-divisions can be considered to be random movements. The catch statistics show that Finnish catches form the major part of the total flounder catch in Sub-divisions 29N and 30 (Anon. 1983). The Swedish catches are of minor importance and the USSR catches are taken in the southern part of Sub-division 29 from another population (VITINSH 1976). The flounder in Sub-divisions 29N and 30 can thus be regarded as a discrete stock, or a subpopulation, and should be assessed separately.

The flounder population in the Gulf of Finland can be divided in two different stocks. One stock is distributed along the Finnish coast with some migration from the Gulf of Finland and from the Finnish coast to the USSR coast. The other stock is distributed along the USSR coast and has some connections with the eastern Gotland population (VITINSH 1976). Some exchange occurs between these two stocks in the Gulf of Finland, but the annual rate is insignificant. The combined results of our taggings and the taggings made by HALME (1962) during 1959-61 in the western part of the Gulf of Finland (915 specimens tagged) show about 17 % emigration from the Gulf of Finland to Sub-divisions 29N, 29S and 28; 4 % of the recoveries were made in Sub-division 28, 6 % in Sub-division 29S and 7 % in Sub-division 29N. Of the flounder recaptured in the Gulf of Finland, 69 % were found near the Finnish coast and 31 % had migrated to the USSR coast. Migration from the stock off

the USSR coast to the Finnish coast is only 2.0 % of the total tagging recoveries (taggings made in 1967-70, 1971-75 on the USSR coast in the western part of the Gulf of Finland, VITINSH 1976). According to these taggings, the instantaneous emigration rate of flounder from the Finnish to the USSR coast is about $E = 0.08$ and the instantaneous immigration rate $I = 0.02$. Thus we consider that the stocks off the Finnish and USSR coasts should be assessed separately.

The total instantaneous mortality rate obtained from the tagging data, $Z = 0.75$ for the years 1975-77, is higher than that calculated from the age distribution for age groups 4-11, $Z = 0.51$. This is probably due to the lower reporting rate of recaptures in the late 1970's compared with the rate during the taggings and the higher catchability of tagged flounder in the gillnet fishery.

References

- Anon. 1983: Report of the Working Group on Assessment of Demersal Stocks in the Baltic, Copenhagen, 6-13 April 1983. - ICES C.M. 1983/Assess:15. (mimeo).
- ARO, E. & SJÖBLÖM, V. 1982: Stock assessment of flounder off the coast of Finland in 1975-81. - ICES C.M. 1982/J:25 (mimeo).
- BAGGE, O. 1966: Tagging of flounder in the western Baltic, the Belt Sea, and the Sound in 1960-62. - ICES C.M. 1966/D1. (mimeo).
- CIEGLEWICZ, C. 1963: Flounder migrations and mortality rates in the Southern Baltic. - ICES C.M. 1963/Pap. 78.
- HALME, E. 1962: Tvärminnessä suoritetettujen kampelamerkintöjen tuloksia. (Results of the flounder taggings made in Tvärminne). - Kalamies No. 1: 4-8.
- OTTERLIND, G. 1966: Flundrans vandringsvanor i mellersta Östersjön. - Ostkusten No. 1: 19-26.
- OTTERLIND, G. 1967: Migration of plaice and flounder in the southern Baltic. - ICES C.M. 1967/F:34. (mimeo).
- PAULIK, G.J. 1962: Use of the Chapman-Robson survival estimate for single- and multirelease tagging experiments. - Trans. Am. Fish. Soc. 91: 95-98.

- VITINSH, M. 1976: Einige Gesetzmässigkeiten in der Verteilung und Migration der Flunder (*Platichthys flesus* L.) in der östlichen und nordöstlichen Ostsee. - Fischerei-Forschung 14; Sonderheft 1: 39-48.

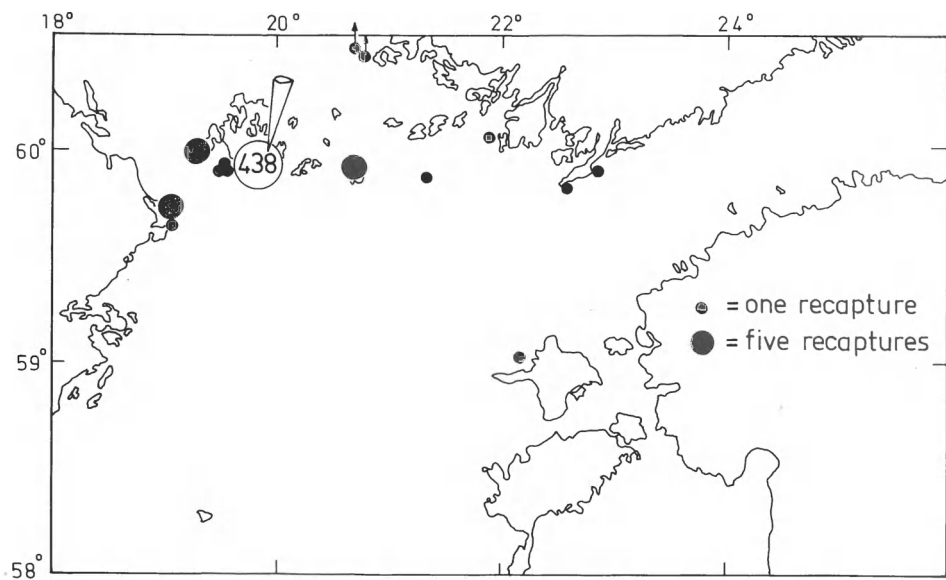


Figure 1. The recaptures of flounder tagged in 1975 in the Åland Islands.
(The tagging place is shown with an arrow.)

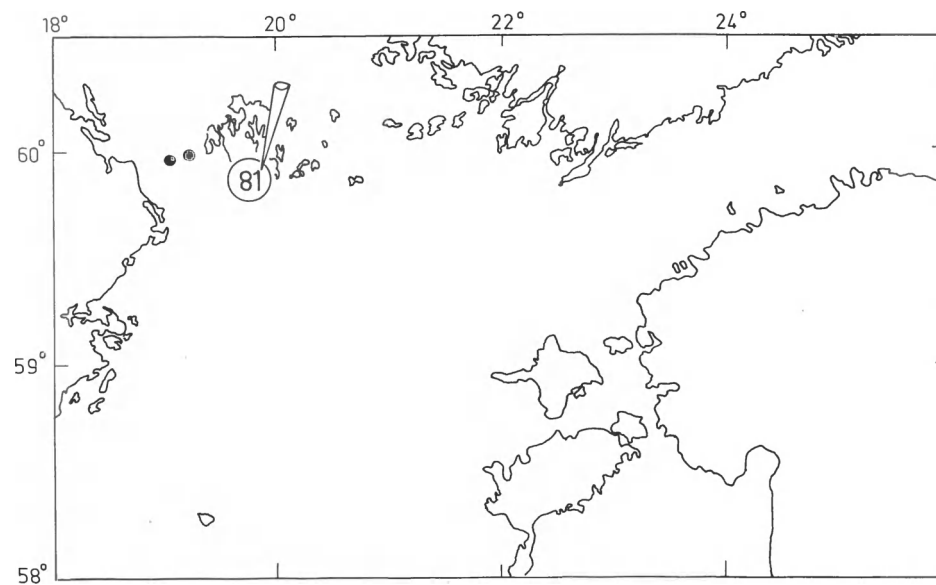


Figure 2. The recaptures of flounder tagged in 1976 in the Åland Islands.
(The tagging place is shown with an arrow.)

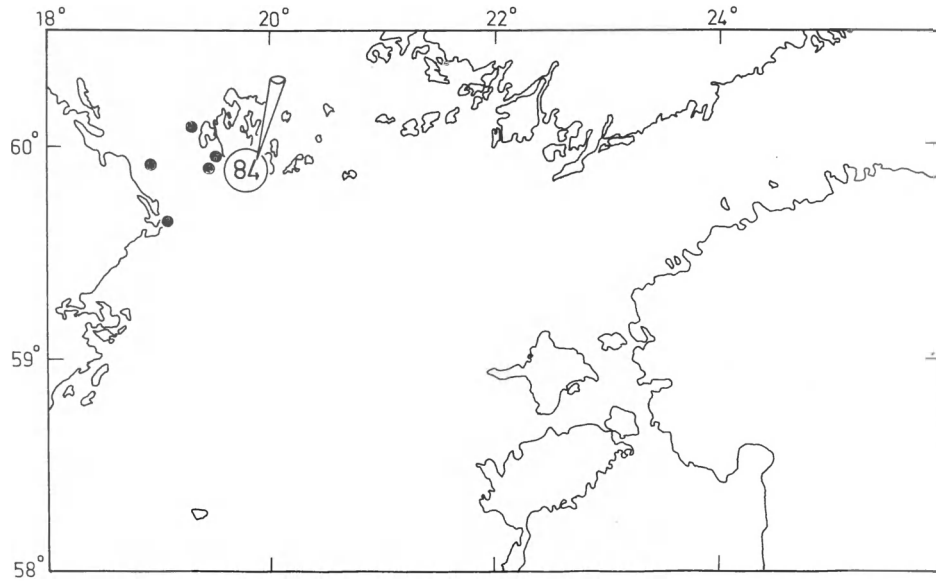


Figure 3. The recaptures of flounder tagged in 1977 in the Åland Islands.
(The tagging place is shown with an arrow.)

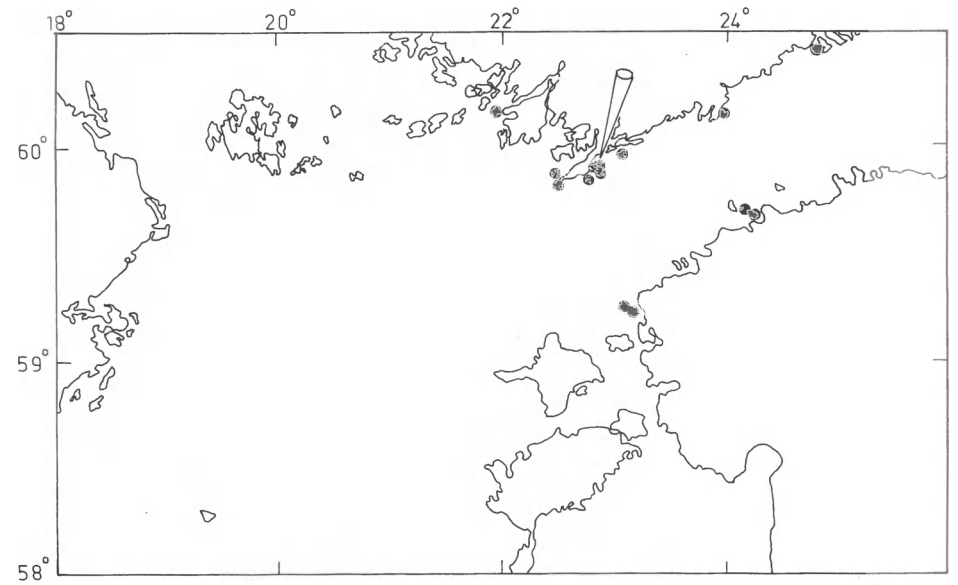


Figure 4. The recaptures of flounder tagged in 1975 in the Gulf of Finland.
(The tagging place is shown with an arrow.)

Table 1. Data on flounder taggings in the years 1975-77 and recoveries up to the end of 1982.

Tagging date	Tagging place	Number tagged	Mean length (cm)	Recoveries	
				No.	%
Oct-Nov 1975	Gulf of Finland	327	26.3	14	4.3
Apr-Jun 1975	Aland Islands	1671	26.2	238	14.2
Oct-Dec 1975	Islands	1875	27.0	226	12.1
May 1976	Aland Islands	1080	24.9	83	7.7
May-Jun 1977	Aland Islands	985	25.6	89	9.0

Table 2. Length distribution of tagged flounder and recoveries in various length groups.

Length group (cm)	Number tagged	Recoveries	
		Number	%
12-13	1	-	-
14-15	1	-	-
16-17	26	-	-
18-19	133	3	2.3
20-21	474	27	5.7
22-23	1130	119	10.5
24-25	1645	203	12.3
26-27	1239	138	11.1
28-29	630	84	13.3
30-31	295	38	12.9
32-33	197	19	9.6
34-35	102	14	13.7
36-37	42	3	7.1
38-39	15	1	6.7
40-41	6	1	16.7
42-43	2	-	-
Total	5938	650	10.9
Mean length (cm)	26.0	26.3	

Table 3. The survival (\bar{S}) and total instantaneous mortality (\bar{Z}) rates of flounder calculated from the taggings made in Finland in 1975-77.

Year of tagging	Number tagged	Number of recaptures (years after tagging)							Total	\bar{S}	\bar{Z}
		1	2	3	4	5	6	7			
1975	3873	212	60	59	17	7	8	5	368	0.47	0.75
1976	1080	19	10	4	1	-	-	-	34	0.39	0.91
1977	985	34	13	5	2	1	-	-	55	0.38	0.95
Total	5938	265	83	68	20	8	8	5	457	0.46	0.75

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